

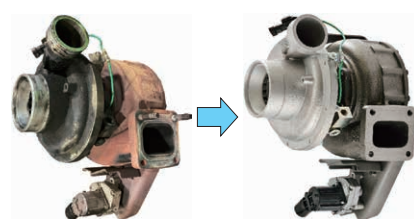
Remanufacturing of Turbochargers for Vehicles

Remanufactured turbochargers made by recycling resources and adding quality reliability

In recent years, an environmental awareness in society is growing in general and activities to create a sustainable society for the achievement of SDGs are gaining momentum. This report introduces remanufactured turbochargers provided by IHI Turbo Service Co., Ltd. to respond to the needs of society and customers.



Yokohama Service Center



Remanufacturing of a used turbocharger (Remanufactured turbocharger)



High performance turbocharger provided by ITSJ at the customization market

IHI Turbo Service

IHI Turbo Service Co., Ltd. (ITSJ) manufactures and sells aftermarket vehicle turbochargers. The current company name was renamed to the above one in April 2021, while the company had been Clover Turbo Co., Ltd. since its founding in April 2014. The company was founded when the remanufacturing market of automobile parts expanded amid the growing worldwide awareness of reusing and recycling, and then listed manufacturing and selling of remanufactured turbochargers as one of the key pillars of its business in order to proactively enter the market. ITSJ is the only company in the IHI Group that manufactures and sells remanufactured turbochargers and ITSJ contributes to the activities to expand IHI's lifecycle business and achieve SDGs.

ITSJ has its head office and Yokohama Service Center with manufacturing, warehousing, and shipping functions in IHI

Yokohama Office. ITSJ has established its business structure to provide higher value as a company taking the role of a vehicle turbocharger provider in IHI.

What is the “Aftermarket”?

The aftermarket refers to various services required after a customer purchases a product. The market formed by services and products provided by companies other than automobile manufacturers is widely known as the automobile aftermarket.

The automobile aftermarket can be divided into two sections. One is the repair market where products and services required for automobile maintenance are provided to customers, and the other is the customization market where products and services are provided to customers who find enjoyment in improving automobile performance and dressing up their vehicles. The former is relatively stable and

is little affected by the economic conditions and focuses on prices because customers tend to require low prices. The latter one is related to hobbies and luxury items and greatly affected by the economic conditions and focuses on added value and brands because customers tend to require products of high quality and performance.

ITSJ provides turbochargers to both of these markets. The turbochargers provided to the repair market include brand-new products and recycled used products. The latter ones are called remanufactured products and have been in the automobile industry over the long haul. In the customization market, the company provides high performance turbochargers (mainly turbochargers with high flow capacity), in which IHI's design and manufacturing technologies are used, for sports car owners.

Future prospects of the aftermarket

The automobile industry is at a significant turning point while the movement toward carbon neutrality is rapidly accelerating all over the world. The main automobile manufacturers of various countries are working towards complete electrification after 2030, and the trend is considered to be accelerating. On the other hand, there are still many issues to be addressed for electrification, and various kinds of technological innovation are required to put it into practice. Especially for trucks, buses and other large commercial vehicles, there is a need for increasing battery capacity to secure the range and shortening charging time.

Under such circumstances, the combination of a diesel engine and a turbocharger is said to be the technology that is vital for meeting the targets related to both the environmental friendliness and performance, and it is likely that there will still be high demand for the technology in commercial vehicles even after passenger vehicles become commonly electrified. Besides, the aftermarket, as mentioned earlier, has the opportunity after customers purchase products, and in particular, the automobile repair market is said to be

created roughly eight years after the purchase of automobiles. Therefore, the demand for turbochargers in the aftermarket is considered to remain unchanged for the time being amid the progress made steadily in electrification.

Remanufacturing business

Remanufacturing business has the repetitive business cycle in which used products that have been broken and removed are collected, repaired, recycled, and sold to customers again in the repair market. Though remanufactured products have slightly inferior performance and durability than brand-new products, their prices decrease to approximately 50% to 70%, which matches the needs of customers, and the business continues to expand in the market in which low prices tend to be well received. In recent years, the remanufacturing business is growing thanks to the increasing environmental awareness and activities to create a sustainable society for achieving SDGs.

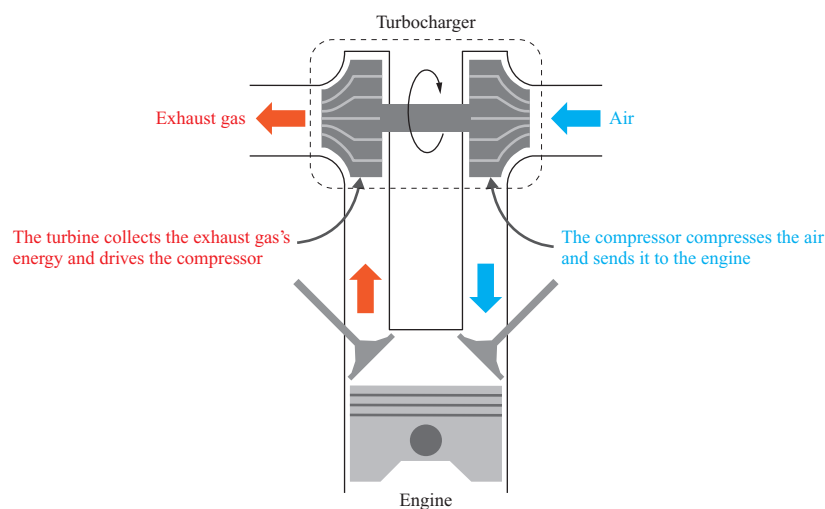
Having said that, there have been a large number of business operators entering into the market in line with the growing demand, and some of them sell remanufactured products of poor quality at low prices. It is quite common that a vehicle equipped with such an inferior remanufactured product fails to drive, which becomes a challenge in the entire market. Therefore, high-quality and reasonable remanufactured turbochargers are demanded in general.

Remanufactured turbocharger

1. Components of a turbocharger

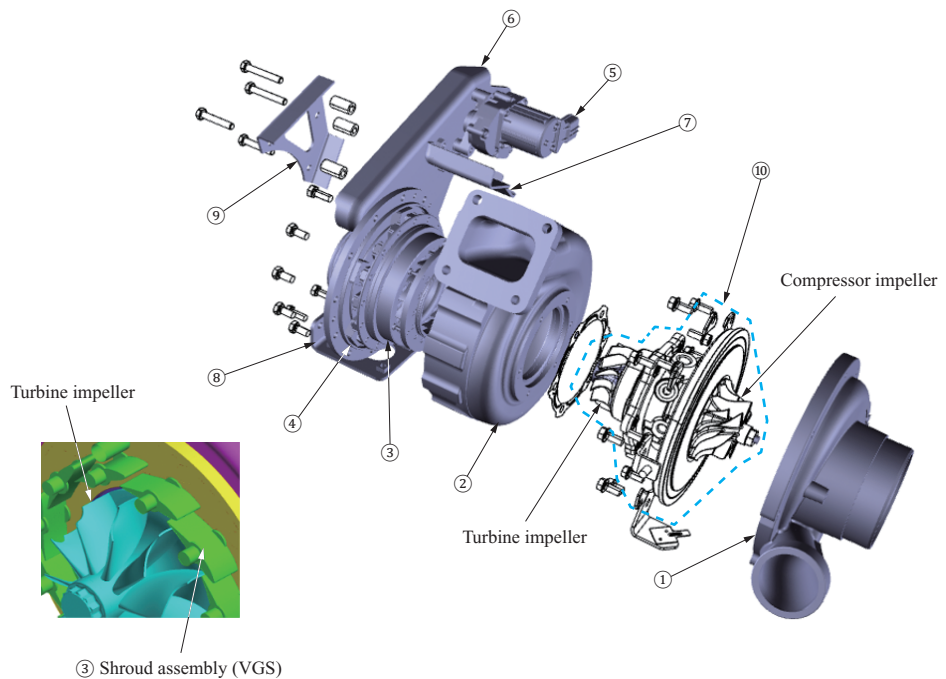
A turbocharger transmits power to the turbine impeller using exhaust gas emitted from a vehicle and supplies compressed air to the engine by turning the compressor impeller attached on the opposite side.

The following figure shows the main components of a turbocharger equipped with a variable geometry system (VGS), which is the main remanufactured turbocharger product of ITSJ.



Roles and structure of a turbocharger

No.	Component name
①	Compressor housing
②	Turbine housing
③	Shroud assembly
④	Cover assembly
⑤	Electric actuator
⑥	Actuator bracket
⑦	Actuator heat shield plate
⑧	Insulator bracket
⑨	Reinforcing plate
⑩	Center section



Components of a VGS turbocharger

The rotating shaft with impellers is assembled to a part called a center section ⑩, and is equipped with a turbine housing ② through which the exhaust gas flows and a compressor housing ① through which the air flows. It also has a shroud assembly ③ with a VGS to adjust the amount of gas and an electric actuator ⑤ to control the VGS.

2. Process of manufacturing a remanufactured turbocharger

An essential item in manufacturing a remanufactured turbocharger is a used turbocharger called a “core.” In this process, we provide a remanufactured turbocharger to a customer at a reasonable price while asking the customer to send us a core which finished its role, recycling it into a remanufactured turbocharger and providing it to another customer. The core collected from a customer is disassembled, and parts to be recycled according to specifications are



Turbochargers recycling cycle diagram

sorted out. The specified used parts undergo the processes such as cleaning and blasting (depending on the part) to change to recycled parts. The recycled parts are inspected according to the standard for parts recycling defined based on the design concept of a turbocharger mass-produced by IHI, and only those that passed the inspection are used for the manufacturing.

In the assembly, we use the recycled parts and IHI’s genuine new parts in some portions of the product. The new parts include a center section which is a rapidly rotating body, parts related to connection that have a great impact on the product quality and parts that are in short supply.

The manufacturing process and rules are basically in accordance with the IHI mass-production standard to maintain high quality. And they are optimized to meet specific requirements of small-lot production for the aftermarket and the use of recycled parts.

Through this recycling process, turbochargers that finished their role are remanufactured into products similar to new ones and shipped to customers again.

3. Benefits of ITSJ’s remanufactured turbocharger

As mentioned earlier, ITSJ’s remanufactured turbocharger is made by combining recycled parts and new parts made by IHI. IHI’s turbocharger has a proven track record in that it is adopted in many mass-produced vehicles, and the reliability of its quality is well appreciated also in the aftermarket. The core technology used in IHI’s turbocharger is the center section containing rapidly rotating impellers.

Some of the remanufactured products sold on the market were made by assembling copied parts fabricated with companies’ original theories and remanufacturing methods,

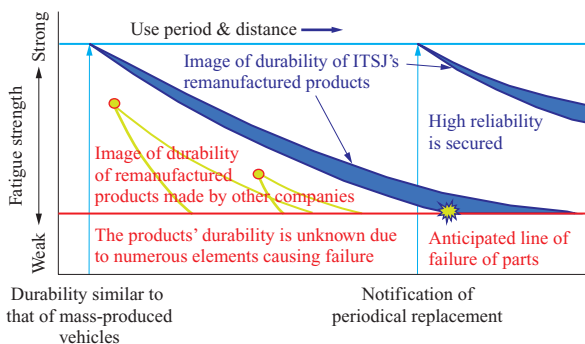


Image of durability of a remanufactured turbocharger

and it is impossible to anticipate such products' durability, especially of their center section, which is a matter of concern. There are quite a few cases in which a customer purchased an inexpensive remanufactured product and it got broken immediately after being installed.

On the other hand, ITSJ can use IHI's quality genuine new center section in remanufactured turbochargers to relieve customers' concerns about remanufactured products and provide added value of products' durability, which is as long as that of brand-new products. Our remanufactured turbochargers also have reliability similar to that of products delivered to automobile manufacturers. It is because the parts remanufacturing and initial configuring of the control unit are conducted based on the design concept of IHI's mass-produced turbocharger.

Remanufactured turbochargers are required in a large number of commercial vehicles used for business purposes whose running distance is long. The main remanufactured

products produced by ITSJ right now are turbochargers for commercial vehicles, and the company will respond to customers' needs by further expanding the product lineup.

The IHI Group has production sites of vehicle turbochargers all over the world and produces turbochargers for automobile manufacturers. Turbochargers for the aftermarket are manufactured and sold in every region, but only brand-new turbochargers can be handled in the market. ITSJ will expand the remanufacturing business, which will lead to energy savings, resource savings and environmental conservation, together with overseas production sites by making use of knowhow the company has accumulated so far.

< Product information >

IHI Turbo Service Co., Ltd. provides IHI's brand-new turbochargers [IHI TURBO] for the aftermarket and those remanufactured based on the strict quality standards [IHI TURBO REMANUFACTURED]. It also develops and sells high performance turbochargers [IHI TURBO PERFORMANCE] which are used exclusively for sports racing (such as auto racing) and for tuning.

[IHI TURBO]

IHI's original brand-new turbocharger of high quality. This aftermarket brand-new product is affordable for customers.

[IHI TURBO REMANUFACTURED]

Remanufactured turbocharger manufactured based on IHI's strict quality standards. Its performance is similar to a brand-new turbocharger. New parts are used in the rotating body (center section), a core of the turbocharger. It is manufactured using recycled parts in turbine housing, compressor housing and some other areas.

[IHI TURBO PERFORMANCE]

High performance turbocharger developed for sports racing vehicles (for auto racing, etc.) and for tuning.



Business locations

INFORMATION

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Our corporate website introduces our technology categorized according to social issues: “IHI Challenges with Society”. The articles of IHI ENGINEERING REVIEW are also provided there. We would appreciate it if you would visit our website.

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All the information in the article is as of publication.

Please note that the development and product manufacturing may have been terminated and that the authors' affiliations may have been changed. Product names in the article are generally trademarks or registered trademarks of the respective companies.

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